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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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GROUP 1600

Application Number: 09/177,814
Filing Date: October 23, 1998
Appellant(s): GILTON, TERRY L.

Brick G. Power
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 1, 2006 appealing from the Office action mailed November 1, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,882,496	NORTHRUP ET AL	3-1999
5,393,401	KNOLL	2-1995

5,605,662	HELLER ET AL	2-1997
5,693,946	VICKERS ET AL	12-1997
6,379,929	BURNS ET AL	4-2002
5,948,227	DUBROW	9-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1, 3, 4, 7, 11, 18, 22-24, 111, 112 are rejected under 35 U.S.C. 102(e) as being anticipated by Northrup et al [US 5,882,496].

With respect to claim 1, Northrup et al teach an embodiment of a porous silicon electrophoresis device comprising a silicon member in which a plurality of spaced members or columns of porous silicon are formed (column 7, lines 38-43). A negative electrode is formed at one (inlet) end of porous silicon members or columns and a positive electrode is formed at an opposite (outlet) end of porous silicon members or columns (column 7, lines 43-50). Northrup et al further teach that the porous silicon members define an interface between two analysis devices (detectors) (claim 10), and

further teach that the porous silicon regions can increase the surface area of thermopneumatic sensor actuators (column 1, lines 55-65).

3. With respect to claim 3, Northrup et al teach that the columns have pore size of about 1 μm down to about 10 nm (column 7, lines 35-38). Therefore, the columns would be capable of functioning as capillary columns.

4. With respect to claim 4, the columns linearly traverse the substrate (figs. 7-8).

5. With respect to claim 7, the porous silicon can be used to increase the surface area of heated reaction chambers (column 2, lines 10-15).

6. With respect to claim 11, the reaction chambers constitute the entire porous silicon area (column 7, lines 15-36).

7. With respect to claims 18, 22-24, a negative electrode is formed at one (inlet) end of porous silicon members or columns and a positive electrode is formed at an opposite (outlet) end of porous silicon members or columns (column 7, lines 43-50). The electrodes act as a electrophoresis device (column 7, lines 37-50).

8. With respect to claims 111-112, Northrup et al teach the device comprises a silicon member (column 7, lines 38-43).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 5, 7, 8, 10, 11, 14, 25-29, 111, 112 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knoll [US 5,393,401] in view of Northrup et al [US 5,882,496].

With respect to claim 1, Knoll teaches a sensor comprising a silicon substrate (column 2, lines 60-62) with ion selective field effect transistors (column 4, lines 35-40) and ion-selective membranes (porous regions) formed in containments on the silicon substrate (column 5, lines 4-15). Knoll does not teach that the ion selective membranes are comprised of porous silicon.

Nothrup et al, however, teach the use of porous silicon membranes (column 3, lines 50-52), and further teach that porous silicon is capable of increasing the surface area of a silicon device for use in specific pore size arrays, and biological/chemical filters, while maintaining the capability of modification, such as being doped or coated using conventional integrated circuit and micromachining techniques.

Therefore, it would have been obvious to one of ordinary skill in the art for the ion selective membranes of Knoll to be comprised of porous silicon, as suggested by Nothrup et al, in order to increase the surface area of a silicon device for use in specific pore size arrays and biological/chemical filters, while maintaining the capability of modification, such as being doped or coated using conventional integrated circuit and micromachining techniques.

11. With respect to claim 5, ion-selective membranes are formed in containments on the silicon substrate (column 5, lines 4-15), and therefore would only extend partially across the substrate.

12. With respect to claims 7, 8, 10-11, 25-28, Knoll teaches that the enzymes, antibodies microbes or organelles can be immobilized in the membrane (column 5, lines 9-15). Therefore the distance between the reaction regions and the end of the porous regions would be the same.

13. With respect to claim 14, Knoll teaches a sensor comprising a silicon substrate (column 2, lines 60-62) with ion selective field effect transistors (column 4, lines 35-40).

14. With respect to claim 15, the FETs would have a voltage application component and a current detection component (column 4, lines 35-40).

15. With respect to claim 29, Knoll teaches that the ion-selective membranes can be protected by another layer of material (column 5, lines 4-9).

16. With respect to claims 111-112, Knoll teaches a sensor comprising a silicon substrate (column 2, lines 60-62)

17. Claims 1, 3, 5, 6-11, 14, 15, 18, 22-24, 111, 112 are rejected under 35 U.S.C. 103(a) as being anticipated by Heller et al [US 5,605,662] in light of Vickers et al [US 5,693,946], in view of Northrup et al [US 5,882,496].

With respect to claim 1, Heller et al teach a device comprising a silicon wafer (column 12, lines 46-52) having a matrix of addressable microscopic locations on its surface, where each individual micro-location is able to electronically control and direct the transport and attachment of specific binding entities to itself (column 5, lines 35-43). Each micro-location comprises a permeation layer, an attachment layer, and a binding entity layer (fig. 2, column 10, lines 59-67). The permeation and attachment layers are porous (column 15, lines 1-6). Detection may be performed by CCD detectors associated

directly with the device in a sandwich arrangement (column 20, lines 45-50). One of ordinary skill in the art would realize that CCD detectors comprise FETs, as evidenced by Vickers et al (column 4, lines 1-10). Heller et al do not teach that the porous layers comprise the same material as the substrate, silicon.

Nothrup et al, however, teach the use of porous silicon membranes (column 3, lines 50-52), and further teach that porous silicon is capable of increasing the surface area of a silicon device for use in specific pore size arrays, and biological/chemical filters, while maintaining the capability of modification, such as being doped or coated using conventional integrated circuit and micromachining techniques.

Therefore, it would have been obvious to one of ordinary skill in the art for the layers of Heller et al to be comprised of porous silicon, as suggested by Nothrup et al, in order to increase the surface area of a silicon device for use in specific pore size arrays and biological/chemical filters, while maintaining the capability of modification, such as being doped or coated using conventional integrated circuit and micromachining techniques.

18. With respect to claim 3, the microlocation are part of microcapillaries (column 24, lines 15-20).

19. With respect to claim 5, the permeation layer constitutes only part of each microlocation (fig. 6), and therefore would only extend partially across the substrate.

20. With respect to claim 6, microlocations were used for negative control for nonspecific binding (column 25, lines 1-5), which would render these microlocations as control columns.

21. With respect to claims 7-11, the binding entity layers are located underneath the permeation and attachment layers, and may contain antibodies (fig. 6, column 11, lines 15-40).

22. With respect to claim 14, detection may be performed by CCD detectors associated directly with the device in a sandwich arrangement (column 20, lines 45-50). One of ordinary skill in the art would realize that CCD detectors comprise FETs, as evidenced by Vickers et al (column 4, lines 1-10).

23. With respect to claim 15, the FETs would have a voltage application component and a current detection component, as evidenced by Vickers et al (column 6, lines 9-25).

24. With respect to claims 18, 22-24, the device comprises microelectrodes located at the ends of the permeation layers (fig. 6), and the opposite charge of the specific binding entities can be applied to a specified microelectrode while the other microelectrodes are maintained at the sample charge (column 15, lines 55-65), resulting electrodes that are anodes or cathodes.

25. With respect to claims 111-112, Heller et al teach a device comprising a silicon wafer (column 12, lines 46-52).

26. Claims 1, 3-5, 7-9, 13, 16-20, 22-27, 111, 112 are rejected under 35 U.S.C. 103(a) as being anticipated by Burns et al [US 6,379,929] in view of Northrup et al [US 5,882,496].

With respect to claim 1, Burns et al teach a device with isothermally regulated reaction chambers (column 3, lines 45-50) and porous columns of micromachined channels for gel electrophoresis (column 57, lines 33-44) etched on silicon chips (column

57, lines 22-38) as well as temperature sensors (column 62, lines 15-20). Burns et al do not teach that the porous columns are comprised of the same material as the silicon chip, porous silicon.

Nothrup et al, however, teach the use of porous silicon membranes (column 3, lines 50-52), and further teach that porous silicon is capable of increasing the surface area of a silicon device for use in specific pore size arrays, and biological/chemical filters, while maintaining the capability of modification, such as being doped or coated using conventional integrated circuit and micromachining techniques.

Therefore, it would have been obvious to one of ordinary skill in the art for the porous columns of Burns et al to be comprised of porous silicon, as suggested by Nothrup et al, in order to increase the surface area of a silicon device for use in specific pore size arrays and biological/chemical filters, while maintaining the capability of modification, such as being doped or coated using conventional integrated circuit and micromachining techniques.

27. With respect to claim 3, the channels are capable of capillary gel electrophoresis (column 57, lines 45-50), and therefore would be capillary columns.

28. With respect to claims 4, 5, the channels linearly traverse the chip, but only extend partially across the substrate (fig. 2b).

29. With respect to claims 7-9, 25-27, Burns et al teach that following separation of amplification products, a probe conjugated to an antibody may be brought into contact with the amplified marker sequence (column 53, lines 30-40).

30. With respect to claim 13, Burns et al teach that the silicon chip comprise temperature sensors (column 62, lines 15-20).

31. With respect to claim 16, a microprocessor may be on-wafer (column 32, lines 45-52).

32. With respect to claim 17, the output information is stored by the microprocessor (column 32, lines 45-52). The microprocessor would thus act as a memory device.

33. With respect to claims 18-20, Burns et al teach that the device comprises a migration facilitator such as a pump (column 35, lines 50-55), and sealed valves for flow control (column 44, lines 9-40).

34. With respect to claims 22-24, electrodes are located at either end of the channels (column 31, lines 55-65) for purposes of electrophoresis (column 32, lines 65-67), which would require electrodes at one end of the channels to be anodes, and electrodes at the other end to be cathodes.

35. With respect to claim 111-112, Burns et al teach silicon chips (column 57, lines 22-38).

36. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Burns et al [US 6,379,929]] in view of Northrup et al [US 5,882,496], and further in view of Dubrow [US 5,948,227].

Burns et al teach a device with isothermally regulated reaction chambers (column 3, lines 45-50) and porous gel columns of micromachined channels for gel electrophoresis (column 57, lines 33-44) etched on silicon chips (column 57, lines 22-38) as well as temperature sensors (column 62, lines 15-20). Burns further teach that the device comprises a migration facilitator such as a pump (column 35, lines 50-55), and sealed valves for flow control (column 44, lines 9-40). Burns et al fail to teach that the migration facilitator comprises a vacuum source.

Dubrow, however, teaches a vacuum source (column 7, lines 1-10) and further teaches that the vacuum source allows a solution to be driven into a capillary channel (column 7, lines 1-10).

Therefore it would have been obvious to one of ordinary skill in the art to have a vacuum source in the device of Burns et al and Nothrup et al, as suggested by Dubrow, in order to drive a solution into the capillary channels.

(10) Response to Argument

Applicant's arguments, see p.9, filed May 1, 2006, with respect to the rejection of claim 1 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement have been fully considered and are persuasive. The rejection of claim 1 under 35 U.S.C. 112, first paragraph, has been withdrawn. Although applicants do not specifically teach the limitation of porous regions comprising the same material as the substrate, they do teach one embodiment where the porous region and the substrate both comprise silicon, and this has been found to be sufficient to fulfill the written description requirement. Therefore, the rejection of claim 1 under 35 U.S.C. 112, first paragraph, has been withdrawn.

Applicant's arguments filed May 1, 2006 with respect to the rejections under 35 U.S.C. 102 and 103 have been fully considered but they are not persuasive. With respect to applicant's argument that Northrup et al do not teach porous columns that do not communicate with a detector, the Office disagrees. Northrup et al in fact teach that the porous silicon members define an interface between two analysis devices (detectors) (claim 10). Therefore, the porous silicon members would be in communication with the analysis devices, which are considered to be the detectors.

With respect to applicant's arguments regarding the 103(a) rejections with respect to Knoll in view of Northrup et al and Heller et al in light of Vickers et al in view of Northrup et al, applicant appears to argue that the references do not teach porous regions that extend at least partially across a substrate. The Office disagrees with this argument on two points. First, applicant has not recited how the porous regions partially extend through the substrate. Therefore, as long as the porous regions extend through the substrate along one dimension (longitudinally, horizontally, or vertically), then the limitation is fulfilled, which both Knoll et al and Heller et al both teach. Second, the limitation that the porous regions "extend partially across a substrate" can be reasonably interpreted to mean that the porous regions take up space on a substrate, particularly since applicant has failed to define how much of the substrate the porous regions must extend, or what extending partially across a substrate would constitute in terms of dimensions.

With respect to applicant's arguments regarding the 103(a) rejections with respect to Burns et al in view of Northrup et al, applicant argues that claim 1 recites a single-piece apparatus with at least one detector fabricated thereon. These limitations, however, have not been recited in the claim itself. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., detector fabricated on a single piece apparatus) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Claim 1 merely recites a detector in communication with the porous regions, which can include fluid communication under the broadest reasonable interpretation. Furthermore, Burns et al in

fact teach temperature sensors integrated into the device (column 62, lines 15, 25). Applicant further continues to emphasize that the device of Burns et al comprises two pieces bonded together, and would teach away from the invention recited in the instant claim 1. However, as was discussed above, nowhere in claim 1 can the limitation that the device is a single piece structure be found.

For these reasons, it is believed that applicant's arguments are not persuasive.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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